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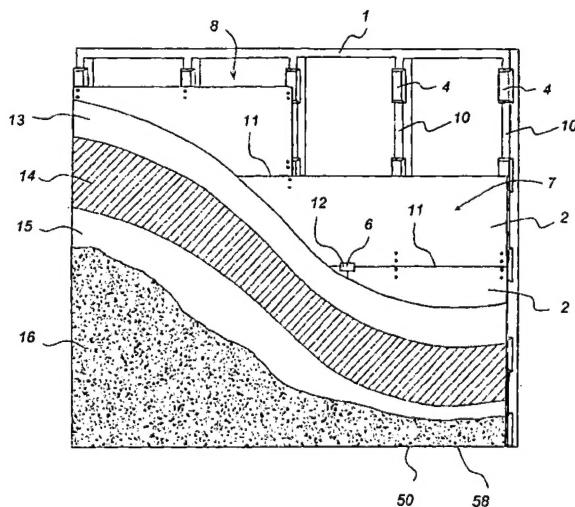
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(54) Title: CAVITY WALL SYSTEM



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(57) Abstract: A cavity wall system and a method of forming a cavity wall including: a wall structure (1); a plurality of outer wall cladding panels (2); and a plurality of discrete mounting elements (4, 5, 6) for mounting the cladding panels a predetermined distance away from the wall structure (1) so as to form a substantially flat exterior wall surface (7) and a substantially uninterrupted internal wall cavity (8) between the cladding panels (2) and the wall structure (1); the mounting elements (4, 5, 6) being sized and arranged so as to allow substantially uninterrupted fluid flow throughout the cavity (8); and the system further including moisture control means defining a moisture control plane to minimise migration of liquid moisture from the cavity (8) into the wall structure (1). The invention also provides a mounting member (4) and a termination member (5) for use as mounting elements in the cavity wall system and method.

**TITLE: CAVITY WALL SYSTEM****FIELD OF THE INVENTION**

The present invention relates to a building system and method of construction of the type providing a wall cavity and a monolithic surface finish.

5 The invention has been developed primarily for use in the construction of domestic dwellings. However, it will be appreciated that the invention is not limited to this particular field of use, being readily adaptable to commercial, industrial and other forms of building construction.

**BACKGROUND TO THE INVENTION**

10 The following discussion of the prior art is intended to place the invention in an appropriate technical context and enable the advantages of it to be fully understood. However, these references should not be construed as an admission that any such art is well known or forms part of common general knowledge in the field.

15 Modern residential housing construction is typically in the form of full masonry, timber framing with attached cladding, or a combination of masonry and timber framing such as brick veneer. Masonry construction in exterior walls may take the form of solid single skin masonry such as concrete, stone or brickwork, or multi-skin masonry such as double brick or cavity brick construction. Multi-skin masonry has the advantage of providing a gap to separate the capillary moisture transfer from one skin to the other. It also allows for water drainage through the provision of weepholes and flashing at horizontal junctions, at openings and at the base of the wall to divert the water to the outside of the building. Multi-skin masonry also provides superior thermal installation characteristics.

20 25 Timber frame construction with attached cladding has been used extensively, particularly in areas of extensive natural and plantation timber. In such situations, wood products are often also used for cladding, in the form of weatherboards or

timber siding. More recently, alternative materials to wood have been used for cladding such as profiled metal, plastic and fibre cement. Foamed plastics such as EPS (expanded polystyrene) have been used as cladding substrates over which texture coatings and reinforcing mesh are incorporated to produce the desired 5 monolithic finish. Cladding systems incorporating EPS as a texture substrate are commonly known as EIFS (exterior insulated finish system). More recently EIFS systems have incorporated improved methods for managing moisture that may penetrate the exterior finish, for example around window openings and wall connections. One such method involved the inclusion of a drainage plane material 10 such as building wrap between the frame or sheathing and the EPS substrate panel, which provides an improvement on bonding the EPS directly to the sheathing. A further improvement was to profile the back of the foam substrate panel or install battens prior to panel installation, so as to provide a space for water drainage and potentially ventilation.

15 The increasing trend in developed countries around the world is to provide greater control over the interior environments of buildings to enhance comfort levels for human habitation. Further to this trend, the global impetus to control greenhouse gas emissions has led to increasing levels of energy efficiency being adopted or mandated by building and town planning regulators. Increased energy efficiency 20 generally involves increased levels of insulation and sealing of walls, so as to isolate more effectively the interior dwelling space of buildings from the external environment.

25 This trend toward improved insulation has tended to dictate more extensive use of construction techniques involving wall cavities, in conjunction with improved insulation materials such as flexible cavity lining membranes or building wraps. While providing greater energy efficiency, however, these techniques have given rise to new difficulties, particularly in terms of water management, moisture control and drainage in wall cavities because historically, the complicating factors associated 30 with insulation membranes and building wraps did not arise. More particularly, it will be appreciated that if moisture is able to penetrate the external envelope of the building and then permeate the internal timber framing, either as a result of

inadequate design or faulty construction, and the framing is unable to dry relatively quickly, it can require costly corrective maintenance. If left unchecked, this can lead to wood rot and accelerated structural deterioration. This problem is particularly significant in areas of high rainfall or high humidity, especially if in conjunction with  
5 strong winds.

In parallel with the tendency toward improved energy efficiency, and the concomitant need for more effective water management in new construction techniques, there has been an architectural trend toward a monolithic masonry style of external appearance in domestic dwellings, while retaining the design flexibility  
10 and cost effectiveness of timber frame and cladding construction.

To this end, one known construction technique involves attaching a cement or fibre cement sheet material to a timber frame, over a pliable building membrane or building wrap. Intermediate layers of sarking or building paper, as well as bracing panels, insulating panels, fire rating panels, and the like may additionally or  
15 alternatively be included. A textured or rendered finish is then applied to the fibre cement sheet substrate, so as to create an effectively continuous monolithic appearance similar to that of rendered brickwork. The render may optionally be paint finished to a desired colour or surface texture. Such techniques have been relatively successful in providing the desired aesthetics and architectural flexibility in  
20 a cost-effective manner. Hitherto, however, they have either not provided a significant wall cavity and have therefore afforded sub-optimal insulation characteristics, or have not provided significant water management functionality within the wall cavities. These techniques have therefore been compromised either in terms of energy efficiency, durability under adverse environmental conditions, or  
25 both, particularly in the event of substandard workmanship which is widely prevalent in the building industry. In many cases, previously known techniques are also compromised aesthetically because the joints between cladding panels are highly visible and are therefore unable to convey a convincing visual impression of monolithic masonry construction.

It is an object of the present invention to provide a building system and method of construction that overcomes one or more of the disadvantages of the prior art, or at least provides a useful alternative.

## DISCLOSURE OF THE INVENTION

5 Accordingly, in a first aspect, the invention provides a cavity wall system including:

- a wall structure;
- a plurality of outer wall cladding panels; and
- 10 a plurality of discrete mounting elements for mounting the cladding panels a predetermined distance away from the wall structure so as to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure;
- the mounting elements being sized and arranged so as to allow substantially uninterrupted fluid flow throughout the cavity; and
- 15 the system further including moisture control means defining a moisture control plane to minimise migration of liquid moisture from the cavity into the wall structure.

According to a second aspect, the invention provides a method of forming a cavity wall, said method including the steps of:

- 20 forming a wall structure;
- providing a plurality of outer wall cladding panels; and
- mounting the cladding panels a predetermined distance away from the wall structure with a plurality of discrete mounting elements to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure;
- 25 sizing and arranging the mounting elements so as to allow substantially uninterrupted fluid flow throughout the cavity; and
- providing moisture control means to define a moisture control plane adapted to minimise migration of liquid moisture from the cavity into the wall structure.

According to third aspect, the invention provides a cavity wall formed in accordance with the method of the second aspect of the invention as described above.

In one preferred embodiment of the invention, the wall structure is formed from concrete or masonry, and the moisture control plane is formed by a coating of sealant or moisture resistant paint on the cavity side of the structure. In a variation of this embodiment, a relatively dense or moisture-impervious concrete or other formulation is used for the wall structure itself, such that an additional coating of sealant or paint is not required. In a further preferred variation, a pliable building membrane is used to cover and seal the wall structure, and in this case, the membrane itself forms the moisture control plane.

In an alternative and particularly preferred embodiment, the wall structure is formed from a timber frame, and the moisture control plane is formed by a substantially waterproof pliable building membrane that is preferably permeable to moisture vapour, or a plurality of overlapping membranes, covering the outer or cavity side of the frame. The membrane or membranes are preferably breathable or permeable to water vapour, to enable the underlying frame to dry in the event that it does become damp or wet as a result of water or moisture ingress.

It will be appreciated that in each of these embodiments, the moisture control means defining the moisture control plane may take the form of a separate coating, covering, layering or membrane, whether individual or composite in nature, or may be inherent in the composition of the wall structure itself. In any case, the moisture control plane serves to redirect liquid water within the cavity downwardly for easy escape to the outside of the structure individually or in combination with flashings, while permitting migration of water in vapour form through the moisture control plane so as to facilitate drying of the underlying wall structure.

Preferably also, the membrane includes an outer reflective surface, or a supplementary sarking membrane having a reflective outer surface is provided, to enhance the thermal insulation characteristics of the wall. In situations where maximum thermal insulation is required, outwardly directed reflective surfaces are

applied to both the cavity side of the cladding panels and the cavity side of the wall structure, using suitable paints, coatings, sarkings and/or membrane materials.

Preferably, supplementary spacers are included to maintain the internal wall cavity between the pliable building membrane and the cladding panels, and to reduce wind-induced movement of the membrane, particularly between the framing members. Advantageously, these supplementary spacers minimise any "flapping" of the membrane under high or variable wind conditions.

Preferably, a lower periphery of the cavity includes an opening to permit drainage of liquid from the cavity and venting of the cavity. Preferably, an upper periphery of the cavity includes a vent that permits venting of the cavity.

Preferably, the exterior wall surface defined by the cladding panels constitutes a substrate supporting at least one outer finishing layer. Preferably, the outer finishing layer conceals the edges between adjacent cladding panels and any exposed portions of the mounting elements to provide a monolithic finish over the exterior wall surface. More preferably, the outer finishing layer is applied by rendering or textured coating, and is optionally sealed, primed, painted or a combination thereof to produce an outer surface finish resembling that of monolithic masonry construction.

In the preferred embodiment, the cladding panels are formed substantially from fibre cement sheet. In this embodiment, the exterior surface of each cladding panel is preferably coated with an outer finishing layer such as render or paint, and the interior surface of each cladding panel is preferably covered with a carbonation reducing coating, so as to reduce differential carbonation within the fibre cement panel. Alternatively, the substrate panels can be formed from other materials such as EPS, of sufficient strength and thickness to span between the respective mounting elements.

Preferably, the exterior wall surface is coated with a sub-layer of render, a reinforcing mesh layer over the sub-layer, and an external finishing layer over the reinforcing layer.

Preferably, the mounting elements include both mounting members and termination members. These members can be formed from materials of sufficient strength to support the intended dead and imposed live loads, including shaped metals, extruded or processed plastics, and the like.

5 In a fourth aspect, the invention provides a mounting member for use in the cavity wall system and method as described above, the mounting member including:

a mounting portion adapted for attachment to a wall structure;

10 a spacing portion adapted to space at least one associated cladding panel outwardly from the mounting portion by a predetermined distance corresponding to the intended depth of an internal wall cavity;

15 and at least one positioning portion adapted for connection to the associated cladding panel;

the mounting member being adapted, in conjunction with a plurality of like members, to support and position a plurality of cladding panels in substantially contiguous each to edge relationship at the predetermined distance away from the wall structure, thereby to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure.

20 Preferably, the mounting portion is adapted for attachment to the wall structure over the moisture control plane.

In one preferred embodiment, the mounting member takes the form of a mounting block wherein the mounting portion is defined by an inner face of the block, the spacing portion is defined by a main body of the block, and the positioning portion is defined by an outer face of the block. Preferably, a plurality of these 25 mounting blocks in spaced apart relationship support and position the plurality of cladding panels by fasteners driven into the cladding panels, through the respective blocks, and into the underlying wall structure. It is also preferred that the mounting members are profiled to allow substantially uninterrupted fluid flow around or through the respective bodies.

In another preferred embodiment, the mounting member takes the form of a mounting bracket, wherein the mounting portion includes a mounting plate, the spacing portion includes a spacing web, and the bracket further includes:

5 a first pair of spaced apart substantially parallel positioning surfaces interconnected by an orthogonal web, both first positioning surfaces being substantially parallel to the mounting plate and located at one end of the spacing web opposite the mounting plate; and

10 a second pair of spaced apart substantially parallel positioning surfaces interconnected by an orthogonal web, both second positioning surfaces being substantially parallel to the mounting plate and located at the end of the spacing web opposite the mounting plate;

15 the first pair of positioning surfaces and the second pair of positioning surfaces and their respective interconnecting webs forming oppositely directed substantially U-shaped positioning channels, the positioning channels being adapted to receive and locate adjacent edges of adjoining cladding panels, to retain the panels in substantially contiguous each to edge relationship, outwardly of the wall structure.

Preferably, the mounting portion includes a perforation for a fastener.

20 Preferably, the spacing web includes a spacing plate extending substantially normally to the mounting plate by a predetermined distance corresponding to the intended depth of the wall cavity. Preferably also, the positioning surfaces are located on respective positioning plate flanges.

According to a fifth aspect, the invention provides a termination member for use in the cavity wall system and method as defined, the termination member including:

25 a mounting portion adapted for attachment to a wall structure;

a spacing portion extending outwardly from the mounting portion by a predetermined distance corresponding to the intended thickness of the internal wall cavity;

a positioning portion connected to the end of the spacing portion opposite the mounting portion, the positioning portion being adapted for connection to at least one associated cladding panel;

5 the termination member being adapted to support and position the associated cladding panel at the predetermined distance away from the wall structure, and to define an edge of the exterior wall surface;

the termination member further including a drainage portion adapted to permit drainage of liquid from the wall cavity.

10 Preferably, the mounting portion is adapted for attachment to the wall structure over the moisture control plane.

In one preferred embodiment, the termination member takes the form of a starter strip wherein the mounting portion includes a mounting plate, the drainage portion includes a drainage surface extending outwardly from the mounting plate, and the positioning portion includes:

15 an inner positioning surface extending in one direction from the drainage surface parallel to the mounting plate;

a support surface extending outwardly from the inner positioning surface; and

an outer positioning surface extending from the support surface parallel to the mounting plate;

20 whereby the inner positioning surface, support surface and outer positioning surface together form a substantially U-shaped channel adapted to receive and locate a peripheral edge of the associated cladding panel.

25 Preferably, the drainage surface is configured to drain away from the mounting plate. In another preferred embodiment, the drainage surface drains towards the support surface. In yet another preferred embodiment, the drainage surface includes perforations for drainage or ventilation.

Preferably, the support surface includes a drainage groove to permit drainage of liquid from the interior surface of cladding panels and away from the wall cavity.

The outer positioning surface is preferably located on an outer positioning flange having perforations for keying with an over-coating render.

Further, the termination member preferably includes an alignment flange extending generally outwardly from the outer positioning flange for supporting and aligning an applied exterior wall surface coating. The termination member also preferably includes a perforated flange extending away from the U-shaped channel generally orthogonally from the support surface for providing ventilation or drainage along an edge of the exterior wall surface.

In another preferred embodiment, the termination member takes the form of a top strip wherein the mounting portion comprises a mounting plate, the spacing and ventilation portion comprises a perforated spacing surface extending outwardly from the mounting plate, and the positioning portion comprises:

an inner positioning surface extending in one direction from the perforated spacing surface parallel to the mounting plate;

a support surface extending outwardly from the inner positioning surface; and

an outer positioning surface extending from the support surface parallel to the mounting plate;

whereby the inner positioning surface, support surface and outer positioning surface together form a substantially U-shaped channel adapted to receive and locate a peripheral edge of the associated cladding panel.

The outer positioning surface is preferably located on an outer positioning flange having perforations for keying with an over-coating render.

Further, the termination member preferably includes an alignment flange extending generally outwardly from the outer positioning flange for supporting and aligning an applied exterior wall surface coating. The top strip preferably also includes a perforated flange extending upwardly away from the U-shaped channel generally orthogonally from the support surface to provide ventilation along an edge of the exterior wall surface.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

5 Figure 1 is a perspective view of a cavity wall system according to the invention;

Figure 2 is an enlarged fragmentary view of an off-stud joiner of the cavity wall system;

Figures 3a-3f are perspective views of various embodiments of a mounting member of the cavity wall system;

10 Figure 4 is a fragmentary view of another embodiment of a cavity wall system according to the invention;

Figure 5 is a perspective view of a mounting member for a cavity wall system according to the invention;

15 Figure 6 is a perspective view of another embodiment of a mounting member for a cavity wall system according to the invention;

Figure 7 is a perspective view of a termination member for a cavity wall system according to the invention;

20 Figure 8 is a fragmentary perspective view of another embodiment of a termination member for a cavity wall system according to the invention, and showing an embodiment of a drainage groove in the support surface;

Figure 9 is a fragmentary partially cut-away view of an embodiment of a cavity wall system including the termination member shown in Figure 7;

Figure 10 is perspective view of a termination member in the form of a vented top strip according to the invention; and

Figure 11 is sectional view of a wall assembly incorporating upper ventilation of the cavity through the vented top strip of Figure 10.

## PREFERRED EMBODIMENTS OF THE INVENTION

Referring to the drawings, the invention provides a cavity wall system including a wall structure 1 and a plurality of outer wall cladding panels 2. In the preferred embodiment, the wall structure is a building frame with its outer side substantially covered by moisture control means in the form of a pliable building membrane 3 defining a moisture control plane. Also preferably, the cladding panels 2 are formed substantially from fibre cement sheets, or other materials such as EPS, of sufficient strength and thickness. The system further includes a plurality of discrete mounting elements including mounting members 4, termination members or starter strips 5 and off-stud joiners 6. These are attached over the building membrane to mount the fibre cement cladding panels a predetermined distance away from the building membrane, forming a substantially flat exterior wall surface 7 and a substantially uninterrupted internal wall cavity 8 between the cladding panels and the building membrane. The mounting elements are sized and arranged so as to allow substantially uninterrupted airflow and water drainage throughout the cavity. As best shown in Figure 9, a lower periphery of the cavity includes openings 9 to permit drainage of liquid from the cavity.

In other embodiments, the wall structure may be a masonry wall or a concrete wall. In these other embodiments, the moisture control means may be a coating of sealant or paint. In further alternative embodiments, the moisture control means may be a reflective membrane or a form of sarking attached to the wall structure in a continuous configuration or an overlapping configuration. Reflective membranes further enhance the already increased insulation performance of the cavity wall system over known systems such as direct fix cladding. In embodiments where a pliable building membrane is used, supplementary spacers (not shown) are preferably included to maintain the internal wall cavity 8 between the pliable building membrane 3 and the cladding panels 2 and to reduce wind-induced movement of the pliable building membrane. These spacers are particularly useful where the pliable

building membrane spans between the studs 10 of a frame wall structure 1 or between the mounting elements of the cavity wall system. The spacers can be discrete units or continuous, profiled or solid, and preferably formed from a material with high thermal insulation properties such as expanded polymeric foam material.

5 The spacers may be adhered with tapes, adhesives or fasteners, as appropriate.

The wall surface 7 constitutes a substrate, which is adapted to support at least one outer finishing layer. The outer finishing layer conceals the edges 11 between adjacent cladding panels and the exposed portions 12 of the mounting elements to provide a monolithic finish over the wall surface. In the embodiments shown in 10 Figures 1, 9 and 11, the external wall surface is coated with a sub-layer of render 13, a reinforcing mesh layer 14 over the sub-layer, and an outer rendered layer 15 over the reinforcing layer. The outer rendered layer is ideally painted to produce an outer 15 surface finish 16 resembling that of monolithic masonry construction. Concealing the cladding panels allows the panels to be of different sizes and shapes, which allows for greater flexibility in the positioning of the edges of the panels. Additionally, the interior surface 17 of each cladding panel is preferably covered with a carbonation reducing coating, so as to reduce differential carbonation within the fibre cement panel.

Each mounting member 4 includes a mounting portion 18 adapted for 20 attachment to the frame over the building membrane 3, a spacing portion 19, and at least one positioning portion 20 adapted for connection to an associated cladding panel 2. The spacing portion 19 is sized to space the associated cladding panel outwardly from the frame by a predetermined distance corresponding to the intended depth of the wall cavity 8. In this way, the mounting members are adapted in 25 combination to position and support a plurality of the fibre cement cladding panels in substantially contiguous edge-to-edge relationship at the same predetermined distance away from the frame, so as to form the effectively continuous exterior wall surface 7 and the substantially uninterrupted internal wall cavity 8.

Figures 3a to 3f show several preferred embodiments of the mounting member 30 4. In these embodiments, the mounting member takes the form of a mounting block

wherein the mounting portion 18 is defined by an inner face 21 of the block, the spacing portion 19 is defined by the body thickness 22 of the block, and the positioning portion 20 is defined by an outer face 23 of the block. The simplest embodiment is a substantially right rectangular prism, as shown in Figure 3e. 5 However, the other embodiments are profiled to allow improved fluid flow around or through the body. Figure 3c shows a hollow right rectangular prism with openings 24 at the top and bottom in the installed configuration. The hollow configuration thereby allows fluid to flow downwardly through the body of the mounting member. Figure 3b shows a block with sides 25 that taper inwardly from the inner face 21 towards the outer face 23. Figure 3f shows a block wherein both the top and bottom sides 26 taper downwardly in the installed configuration. The tapered sides featured 10 in these embodiments allow fluid to flow more readily around the body. Figures 3a and 3d each show a right rectangular prism with three parallel channels 27 recessed into the inner face 21 to allow fluid to flow vertically through the body in the installed orientation. Figure 3a shows arcuate channels, while Figure 3d shows rectangular channels. It will be appreciated that many configurations of three-dimensional shaped or profiled spacers may be used. 15

Whatever the precise shape and configuration, a plurality of these mounting blocks are used in appropriately spaced apart relationship to support and position the fibre cement cladding panels by fasteners driven into the cladding panels, through the respective block bodies and into the underlying frame. These fasteners may take the 20 form of nails, screws, staples, tacks or similar forms of fastener. Alternative forms of fastening such as gluing may also be used.

Figures 5 and 6 show alternative types of mounting members, in the form of 25 mounting brackets. In these embodiments, the mounting portion 18 comprises a mounting plate 28 with a pre-formed perforation 29 adapted to receive a fastening element such as a nail or self-tapping screw. The spacing portion 19 comprises at least one spacing web 30 in the form of a plate extending substantially normally to the mounting plate by a predetermined distance corresponding to the intended depth 30 of the wall cavity. The spacing web supports a first pair of spaced apart substantially parallel positioning surfaces 31 interconnected by an orthogonal web 32, and a

second pair of spaced apart substantially parallel positioning surfaces 33 interconnected by an orthogonal web 34. The first and second positioning surfaces are substantially parallel to the mounting plate and in conjunction with their respective interconnecting webs form oppositely directed substantially U-shaped 5 positioning channels 35 and 36. These channels are adapted to receive and locate adjacent edges of adjoining cladding panels 2, to retain the panels in substantially contiguous edge-to-edge relationship, outwardly of the frame 1.

In the embodiment shown in Figure 5, the mounting plate 28 and one spacing web 30 form an L-shape with the spacing web projecting orthogonally from the 10 bottom of the mounting plate in its installed configuration. The end of the spacing web terminates at a pair of identical spaced parallel positioning flanges 37 interconnected midway between their respective ends by an orthogonal web 38. The orthogonal web extends linearly from the spacing web 30. The first positioning surfaces 31 are located respectively on the mutually opposed inwardly facing 15 surfaces of the upwardly projecting portions of the positioning flanges 37. The second positioning surfaces 33 are located respectively on the mutually opposed inwardly facing surfaces of the downwardly projecting portions of the positioning flanges 37. Further reinforcing webs can be added to strengthen the mounting member if necessary. The mounting member of this embodiment is well suited to 20 being formed from extruded aluminium or suitable plastics materials such as vinyl.

In the embodiment of Figure 6, the mounting plate 28 and two spacing webs 30 form a U-shaped channel, with the plane of each spacing web in a vertical orientation when installed. Connected to each spacing web is a corresponding pair of spaced 25 parallel positioning flanges 39 and 40 interconnected by respective orthogonal webs 41 and 42. Both pairs of positioning flanges are parallel to the mounting plate 28 and are connected to a respective spacing web along the side of the respective inner positioning flange. However, one pair of positioning flanges 39 is upwardly directed and the other pair 40 is downwardly directed. Additionally, each outer positioning flange is split vertically in half with one half of the outer positioning flange reversed 30 into the opposing direction. This results in an additional positioning flange 43 directed downwardly from upwardly directed positioning flanges 39 and an

additional positioning flange 44 directed upwardly from downwardly directed positioning flanges 40.

The first positioning surfaces 31 are located respectively on the inwardly facing surfaces of the upwardly directed positioning flanges 39. An additional first 5 positioning surface 46 is located on the inwardly facing surface of the upwardly directed additional positioning flange 44. The second positioning surfaces 33 are located respectively on the inwardly facing surfaces of the downwardly directed positioning flanges 40. An additional second positioning surface 45 is located on the inwardly facing surface of downwardly directed additional positioning flange 43. 10 The mounting member of this embodiment is well suited for cold forming from metals such as galvanised steel, Zincalume or stainless steel, but again may alternatively be formed from suitable plastics materials such as vinyl.

The termination member 5 includes a mounting portion 47 adapted for connection to the building frame, a spacing portion 48 extending outwardly from the 15 mounting portion by a predetermined distance corresponding to the intended thickness of the wall cavity, and a positioning portion 49 adapted for connection to at least one of the outer wall cladding panels 2. The termination member is adapted to support and position the associated cladding panels at the predetermined distance away from the frame, and to define a peripheral edge 50 of the exterior wall surface 20 7. The termination member further includes a drainage portion 51 adapted to permit drainage of liquid from the cavity and air to vent the cavity.

In one preferred embodiment, the termination member takes the form of a 25 starter strip, as best shown in Figures 7, 8 and 9. In this embodiment the mounting portion 47 comprises a mounting plate 52, and the drainage portion 51 comprises a drainage surface 53 extending outwardly from the mounting plate. The drainage surface 53 also forms the spacing portion 48 in this embodiment. The positioning portion 49 comprises an inner positioning surface 54 extending in one direction from the drainage surface parallel to the mounting plate, a support surface 55 extending outwardly from the inner positioning surface, and an outer positioning surface 56 30 extending from the support surface parallel to the mounting plate. The inner

positioning surface, support surface and outer positioning surface together form a substantially U-shaped channel 57 adapted to receive and locate the outer peripheral edge 50 of an associated cladding panel 2.

5 The starter strip is normally located at the bottom peripheral edge 58 of the external wall surface 7. The drainage surface 53 is configured to drain away from the mounting plate 52 towards the support surface 55. The drainage surface preferably also includes perforations 59 for drainage or ventilation of the internal wall cavity 8. The support surface 55 includes a drainage groove 60 to permit drainage of liquid from the interior surface of the cladding panels 2 and away from 10 the cavity 8.

15 The outer positioning surface 56 is located on an outer positioning flange 61 having perforations 62 for keying with an over-coating render. The starter strip also includes an alignment flange 63 extending generally outwardly from the outer positioning flange 61 for supporting and aligning an applied exterior wall surface coating. The starter strip further includes a perforated flange 64 extending away from the U-shaped channel 57 generally orthogonally from the support surface for providing ventilation or drainage along a peripheral edge 50 of the exterior wall surface.

20 The top of the wall or wall section 65 can be terminated by a top strip, an alternative form of the termination member, as best shown in Figures 10 and 11. The top strip extends the full length of the wall termination. The mounting portion 47 comprises a mounting plate 66, and the drainage portion 51 comprises a ventilation surface 67 extending outwardly from the mounting plate. The ventilation surface 67 also forms the spacing portion 48 in this embodiment and includes perforations 68 to 25 vent the wall cavity 8. The positioning portion 49 comprises an inner positioning surface 69 extending in one direction from the ventilation surface parallel to the mounting plate, a support surface 70 extending outwardly from the inner positioning surface, and an outer positioning surface 71 extending from the support surface parallel to the mounting plate. The inner positioning surface, support surface and

outer positioning surface together form a substantially U-shaped channel 72 adapted to receive and locate the outer peripheral edge 50 of an associated cladding panel 2.

The outer positioning surface 71 is located on an outer positioning flange 73 having perforations 74 for keying with an over-coating render. The top strip also 5 includes an alignment flange 75 extending generally outwardly from the outer positioning flange 73 for supporting and aligning an applied exterior wall surface coating. The top strip further includes a perforated flange 76 extending upwardly away from the U-shaped channel 72 generally orthogonally from the support surface. The perforated flange 76 extends sufficiently upwardly to provide for trim cover 10 mouldings 77 and also provides for a perforated area for ventilation to the termination. The upper periphery of the termination, as shown in Figure 11, provides a practical and aesthetically acceptable finish.

The termination member can also be located at other peripheral edges of the 15 external wall surface and at horizontal junctions such as window openings, door openings, mid-storey junctions, flashings and control joints.

It will be appreciated that the termination member is well suited for setting out an external wall surface, supporting cladding panels, forming a wall cavity, permitting drainage from a wall cavity, providing ventilation to a wall cavity, and providing a screed and levelling guide for applying outer finishing layers to the 20 external wall surface.

The mounting elements also include off-stud joiners 6. As shown in Figure 2, one preferred embodiment of this element takes the form of an H-sectioned joiner. The joiner receives and aligns the longitudinal edges of adjacent cladding panels in substantially contiguous relationship, and retains the adjoining panels in coplanar 25 alignment even when the joins do not directly overlie the frame members.

The material strength, gauge, profile and spacing of the mounting elements are such that when the mounting elements are installed with strong durable fasteners they are well suited to withstand very high wind loads. The cavity wall system also allows the fixing of bracing elements (not shown) to the frame 1 to resist shear or

racking loads on the wall from wind, seismic or similar loads on a building. In one preferred form, fibre cement bracing panels are fastened directly to the frame 1. In this embodiment, the mounting elements are provided in various sizes to allow for the space taken up by the bracing panels and to maintain the substantially flat exterior wall surface 7.

5 Fire rating performance can also be incorporated into the cavity wall system. In one preferred form, water-resistant fire-resistant gypsum boards (not shown) are installed onto the frame under the building membrane 3.

10 The cavity wall system provides a vented cavity that is well suited to reduce the tendency to generate cyclic wind pressures in the wall cavity 8. This also reduces the flapping of the building membrane 3 that results from these cyclic wind pressures.

15 Turning now to describe briefly the preferred method of construction of a cavity wall in accordance with the invention, a wall structure is initially constructed. In the preferred embodiment, the wall structure is in the form of a building frame and the outer surface of the frame is covered with a flexible, substantially waterproof building membrane using conventional materials and techniques. The membrane is ideally breathable or permeable to water vapour, to facilitate drying of the underlying frame or wall structure in the event of water or moisture ingress. A series of starter strips are then installed along a lower edge of the frame, at a level corresponding to 20 the lower edge of the wall. A first run of fibre cement cladding panels is then positioned along the bottom edge of the frame, with the bottom edges of the cladding panels being located and captively retained by the respective starter strips. As each panel is vast positioned, the upper edge is engaged with a first series of mounting members, which are successively fastened to the respective underlying framing members. In this way, the bottom edge of each cladding panel in the first run is 25 secured by one or more of the starter strips, and the top edge is secured by one or more of the first row of mounting members. The panels are joined to each other where necessary with respective off-stud joiners.

With the first run thus in place, a second run of cladding panels is installed in a similar manner, with the bottom edge of each panel in the second row being located by the respective positioning surfaces on the first row of mounting members, and the upper edge of each panel in the second row being located by the respective 5 positioning surfaces of a second row of mounting members. This process is repeated for as many rows as are required in order to cover the frame with cladding panels to the required height, with the upper edges of the top row being finished with suitable termination members. In this way, the panels collectively form a substantially flat, effectively continuous external cladding surface and the mounting members provide 10 a substantially uninterrupted internal wall cavity between the cladding panels and the building membrane.

The external cladding surface forms a substrate, to which is preferably added a base layer of render, a layer of reinforcing mesh over the base layer, an outer layer of render over the reinforcing mesh, and a top coat of paint or textured finish, to provide 15 the desired aesthetic such as that reminiscent of monolithic masonry construction. Preferably, the render applied directly to the external cladding surface is forced into the small spaces between the edges of adjacent cladding panels and between the cladding panels and mounting elements. This conceals the edges and any exposed portions of the mounting elements to give a generally continuous and flat monolithic 20 external finish. This also reduces the tendency for the cladding panels to deform, drum or rattle in response to wind, seismic or other loads on the wall. Concealing the cladding panels allows the panels to be of different sizes and shapes, so cladding panels can be cut to fit the particular dimensions and features of the underlying wall 25 structure. This enhances design flexibility, reduces labour and material costs, and minimises wastage of off-cuts.

The construction technique of the present invention allows fast and efficient drainage of water downwardly through the cavity and out through the apertures in the starter strips. At the same time, moist air is able to circulate freely in substantially 30 any direction within the cavity around the mounting members, and out through the top or bottom apertures. These apertures also prevent the accumulation of pressure within the cavity, either as a result of thermal expansion or wind forces, which

otherwise have the potential to force entrapped water through openings in the membrane and into the framing members. The moisture control plane ensures that any liquid moisture within the wall cavity is prevented from migrating into the underlying wall structure.

5        This method of construction also allows for the installation of the mounting elements and the associated cladding panels in one pass. In the preferred form, the installation of the mounting elements and the associated cladding panels effectively occurs simultaneously. This provides an advantage over prior art methods where mounting elements such as battens are fastened to the building frame in a first pass  
10      and the cladding panels installed in a subsequent second pass. This improvement can result in significant reductions in installation time and cost. The use of discrete mounting elements can also result in significant material savings when compared with prior art mounting elements such as elongate timber battens or steel profiled sections.

15       It will be appreciated that the invention thus provides a cavity wall system, which is efficient and cost-effective to construct, allows great design flexibility, provides highly desirable aesthetics reminiscent of more costly construction techniques, provides superior thermal insulation characteristics, provides substantially improved drainage and water management and is significantly more durable in adverse weather conditions relative to comparable known methods of  
20      building construction. In all these respects, the invention represents a practical and commercially significant improvement over the prior art.

25       Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

**THE CLAIMS:-**

1. A cavity wall system including:
  - 5 a wall structure;
  - a plurality of outer wall cladding panels; and
  - a plurality of discrete mounting elements for mounting the cladding panels a predetermined distance away from the wall structure so as to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure;
- 10 the mounting elements being sized and arranged so as to allow substantially uninterrupted fluid flow throughout the cavity; and
- the system further including moisture control means defining a moisture control plane to minimise migration of liquid moisture from the cavity into the wall structure.
- 15 2. A cavity wall system according to claim 1 wherein a lower periphery of the cavity includes an opening to permit drainage of liquid from the cavity and venting of the cavity.
3. A cavity wall system according to claim 1 or claim 2 wherein an upper periphery of the cavity includes a vent to permit venting of the cavity.
- 20 4. A cavity wall system according to any one of the preceding claims wherein the mounting elements include at least one mounting member and at least one termination member.
5. A cavity wall system according to claim 4 wherein the mounting member is a mounting member as defined in any one of claims 52 to 61.
- 25 6. A cavity wall system according to claim 4 or claim 5 wherein the termination member is a termination member as defined in any one of claims 62 to 76.

7. A cavity wall system according to any one of the preceding claims wherein the exterior wall surface defined by the cladding panels constitutes a substrate supporting at least one outer finishing layer.
8. A cavity wall system according to claim 7 wherein the outer finishing layer 5 conceals edges between adjacent cladding panels and any exposed portions of the mounting elements to provide a monolithic finish over the exterior wall surface.
9. A cavity wall system according to claim 7 or claim 8 wherein the outer finishing layer is applied by rendering or textured coating.
10. A cavity wall system according to any one of claims 7 to 9 wherein the outer 10 finishing layer is sealed, primed or painted to produce an outer surface finish resembling that of monolithic masonry construction.
11. A cavity wall system according to any one of claims 7 to 10 wherein the outer finishing layer includes a sub-layer of render, a reinforcing mesh layer over the sub-layer, and an external finishing layer over the reinforcing layer.
- 15 12. A cavity wall system according to any one of the preceding claims wherein the cladding panels are formed substantially from fibre cement sheet.
13. A cavity wall system according to claim 12 wherein an exterior surface of each cladding panel is coated with an outer finishing layer, and an interior surface of each cladding panel is covered with a carbonation reducing coating, so as to reduce 20 differential carbonation within the fibre cement panel.
14. A cavity wall system according to any one of claims 1 to 11 wherein the cladding panels are formed substantially from EPS.
15. A cavity wall system according to any one of the preceding claims wherein the 25 wall structure is formed from concrete or masonry, and the moisture control plane is formed by a coating of sealant or moisture resistant paint on the cavity side of the structure.

16. A cavity wall system according to any one of claims 1 to 14 wherein the wall structure is formed from a relatively dense or moisture-impervious concrete such that an additional coating of sealant or paint is not required to form the moisture control plane.

5 17. A cavity wall system according to any one of claims 1 to 14 wherein a substantially waterproof pliable building membrane is used to cover and seal the wall structure, the membrane forming the moisture control plane.

10 18. A cavity wall system according to any one of claims 1 to 14 wherein the wall structure is formed from a timber frame, and the moisture control plane is formed by a substantially waterproof pliable building membrane covering the outer or cavity side of the frame.

19. A cavity wall system according to claim 18 wherein the building membrane is formed from a plurality of overlapping membranes.

15 20. A cavity wall system according to any one of claims 17 to 19 wherein the building membrane is permeable to moisture vapour.

21. A cavity wall system according to any one of claims 17 to 20 wherein the building membrane includes an outer reflective surface to enhance the thermal insulation characteristics of the wall system.

20 22. A cavity wall system according to any one of the preceding claims including a supplementary sarking membrane having a reflective outer surface to enhance the thermal insulation characteristics of the wall system.

23. A cavity wall system according to any one of the preceding claims wherein outwardly directed reflective surfaces are applied to both the cavity side of the cladding panels and the cavity side of the wall structure to enhance the thermal insulation characteristics of the wall system.

25

- 25 -

24. A cavity wall system according to claim 23 wherein the reflective surfaces are provided by paints, coatings, sarkings, membrane materials, or any combination thereof.

25. A cavity wall system according to any one of claims 17 to 24 including 5 supplementary spacers to maintain the internal wall cavity between any one of the membranes and the cladding panels such that wind-induced movement of the membranes is minimised.

26. A method of forming a cavity wall including the steps of:  
10 forming a wall structure;  
providing a plurality of outer wall cladding panels; and  
mounting the cladding panels a predetermined distance away from the wall structure with a plurality of discrete mounting elements to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure;  
15 sizing and arranging the mounting elements so as to allow substantially uninterrupted fluid flow throughout the cavity; and  
providing moisture control means to define a moisture control plane adapted to minimise migration of liquid moisture from the cavity into the wall structure.

27. A method according to claim 26 including the step of providing an opening at a 20 lower periphery of the cavity to permit drainage of liquid from the cavity and venting of the cavity.

28. A method according to claim 26 or claim 27 including the step of providing a vent at an upper periphery of the cavity to permit venting of the cavity.

29. A method according to any one of claims 26 to 28 wherein the mounting 25 elements include at least one mounting member and at least one termination member.

30. A method according to claim 29 wherein the mounting member is a mounting member as defined in any one of claims 52 to 61.

- 26 -

31. A method according to claim 29 or claim 30 wherein the termination member is a termination member as defined in any one of claims 62 to 76.
- 5 32. A method according to any one of claims 26 to 31 including the step of applying at least one outer finishing layer to the exterior wall surface defined by the cladding panels.
33. A method according to claim 32 wherein the outer finishing layer conceals joins between adjacent cladding panels and any exposed portions of the mounting elements to provide a monolithic finish over the exterior wall surface.
- 10 34. A method according to claim 32 or claim 33 wherein the outer finishing layer is applied by rendering or textured coating.
35. A method according to any one of claims 32 to 34 including the step of sealing the outer finishing layer, priming the outer finishing layer or painting the outer finishing layer to produce an outer surface finish resembling that of monolithic masonry construction.
- 15 36. A method according to any one of claims 32 to 35 wherein the step of applying the outer finishing layer includes the steps of applying a sub-layer of render, applying a reinforcing mesh layer over the sub-layer, and applying an external finishing layer over the reinforcing layer.
37. A method according to any one of claims 26 to 36 wherein the cladding panels 20 are formed substantially from fibre cement sheet.
38. A method according to claim 37 including the step of coating an exterior surface of each cladding panel with an outer finishing layer, and covering an interior surface of each cladding panel with a carbonation reducing coating, so as to reduce differential carbonation within the fibre cement panel.
- 25 39. A method according to any one of claims 26 to 36 wherein the cladding panels are formed substantially from EPS.

40. A method according to any one of claims 26 to 39 wherein the wall structure is formed from concrete or masonry, and the moisture control plane is formed by applying a coating of sealant or moisture resistant paint on the cavity side of the structure.

5 41. A method according to any one of claims 26 to 39 wherein the wall structure is formed from a relatively dense or moisture-impervious concrete such that applying an additional coating of sealant or paint is not required to form the moisture control plane.

10 42. A method according to any one of claims 26 to 39 including the steps of covering and sealing the wall structure with a substantially waterproof pliable building membrane, the membrane thereby forming the moisture control plane.

15 43. A method according to any one of claims 26 to 39 wherein the wall structure is formed from a timber frame, and the moisture control plane is formed by covering the outer or cavity side of the frame with a substantially waterproof pliable building membrane.

44. A method according to claim 43 wherein the building membrane is formed from a plurality of overlapping membranes.

45. A method according to any one of claims 42 to 44 wherein the building membrane is permeable to moisture vapour.

20 46. A method according to any one of claims 42 to 45 wherein the building membrane includes an outer reflective surface to enhance the thermal insulation characteristics of the cavity wall.

25 47. A method according to any one of claims 26 to 46 including the step of providing a supplementary sarking membrane having a reflective outer surface to enhance the thermal insulation characteristics of the cavity wall.

48. A method according to any one of claims 26 to 47 including the step of applying outwardly directed reflective surfaces to both the cavity side of the cladding

panels and the cavity side of the wall structure to enhance the thermal insulation characteristics of the cavity wall.

49. A method according to claim 48 wherein the reflective surfaces are provided by paints, coatings, sarkings, membrane materials, or any combination thereof.

5 50. A method according to any one of claims 42 to 49 including the step of providing supplementary spacers to maintain the internal wall cavity between any one of the membranes and the cladding panels such that wind-induced movement of the membranes is minimised.

51. A cavity wall formed by the method as defined in any one of claims 26 to 50.

10 52. A mounting member for use in the cavity wall system as defined in claim 4 or in the method of forming a cavity wall as defined in claim 29, the mounting member including:

a mounting portion adapted for attachment to a wall structure;

15 a spacing portion adapted to space at least one associated cladding panel outwardly from the mounting portion by a predetermined distance corresponding to an intended depth of the internal wall cavity;

and at least one positioning portion adapted for connection to the associated cladding panel;

20 the mounting member being adapted, in conjunction with a plurality of like members, to support and position a plurality of cladding panels in substantially contiguous each to edge relationship at the predetermined distance away from the wall structure, thereby to form a substantially flat exterior wall surface and a substantially uninterrupted internal wall cavity between the cladding panels and the wall structure.

25 53. A mounting member according to claim 52 wherein the mounting portion is adapted for attachment to the wall structure over the moisture control plane.

54. A mounting member according to claim 52 or claim 53 in the form of a mounting block wherein the mounting portion is defined by an inner face of the

block, the spacing portion is defined by a main body of the block, and the positioning portion is defined by an outer face of the block.

55. A mounting member according to claim 54 adapted for positioning in spaced apart relationship with a plurality of like blocks to support and position a plurality of the cladding panels by means of fasteners driven into the cladding panels, through the respective blocks, and into the wall structure.

56. A mounting member according to claim 52 or claim 53 in the form of a mounting bracket, wherein the mounting portion includes a mounting plate, the spacing portion includes a spacing web, and the bracket further includes:

10 a first pair of spaced apart substantially parallel positioning surfaces interconnected by an orthogonal web, both first positioning surfaces being substantially parallel to the mounting plate and located at one end of the spacing web opposite the mounting plate; and

15 a second pair of spaced apart substantially parallel positioning surfaces interconnected by an orthogonal web, both second positioning surfaces being substantially parallel to the mounting plate and located at the end of the spacing web opposite the mounting plate;

20 the first pair of positioning surfaces and the second pair of positioning surfaces and their respective interconnecting webs forming oppositely directed substantially U-shaped positioning channels, the positioning channels being adapted to receive and locate adjacent edges of adjoining cladding panels, to retain the panels in substantially contiguous each to edge relationship, outwardly of the wall structure.

57. A mounting member according to claim 56 wherein the mounting portion includes a perforation for a fastener.

25 58. A mounting member according to claim 56 or claim 57 wherein the spacing web includes a spacing plate extending substantially normally to the mounting plate by a predetermined distance corresponding to the intended depth of the wall cavity.

59. A mounting member according to any one of claims 56 to 58 wherein the positioning surfaces are located on respective positioning plate flanges.

60. A mounting member according to any one of claims 52 to 59 being profiled to allow substantially uninterrupted fluid flow around or through the member.

61. A mounting member according to any one of claims 52 to 60 formed from a material or materials of sufficient strength to support the intended dead and imposed 5 live loads, being selected from a group comprising metal, plastics, fibre cement, timber and composite materials.

62. A termination member for use in the cavity wall system as defined in claim 4 or in the method of forming a cavity wall as defined in claim 29, the termination member including:

- 10 a mounting portion adapted for attachment to a wall structure;
- a spacing portion extending outwardly from the mounting portion by a predetermined distance corresponding to an intended thickness of the internal wall cavity;
- 15 a positioning portion connected to the end of the spacing portion opposite the mounting portion, the positioning portion being adapted for connection to at least one associated cladding panel;
- the termination member being adapted to support and position the associated cladding panel at the predetermined distance away from the wall structure, and to define an edge of the exterior wall surface;
- 20 the termination member further including a drainage portion adapted to permit drainage of liquid from the wall cavity.

63. A termination member according to claim 62 wherein the mounting portion is adapted for attachment to the wall structure over the moisture control plane.

64. A termination member according to claim 62 or claim 63 in the form of a 25 starter strip wherein the mounting portion includes a mounting plate, the drainage portion includes a drainage surface extending outwardly from the mounting plate, and the positioning portion includes:

- an inner positioning surface extending in one direction from the drainage surface parallel to the mounting plate;
- 30 a support surface extending outwardly from the inner positioning surface; and

an outer positioning surface extending from the support surface parallel to the mounting plate;

whereby the inner positioning surface, support surface and outer positioning surface together form a substantially U-shaped channel adapted to receive and locate a peripheral edge of the associated cladding panel.

65. A termination member according to claim 64 wherein the drainage surface is configured to drain away from the mounting plate.

66. A termination member according to claim 64 or claim 65 wherein the drainage surface drains towards the support surface.

10 67. A termination member according to any one of claims 64 to 66 wherein the drainage surface includes perforations for drainage or ventilation.

68. A termination member according to any one of claims 64 to 67 wherein the support surface includes a drainage groove to permit drainage of liquid from the interior surface of cladding panels and away from the wall cavity.

15 69. A termination member according to any one of claims 64 to 68 wherein the outer positioning surface is located on an outer positioning flange having perforations for keying with an over-coating render.

70. A termination member according to any one of claims 64 to 69 including an alignment flange extending generally outwardly from the outer positioning flange for supporting and aligning an applied exterior wall surface coating.

20 71. A termination member according to any one of claims 64 to 70 including a perforated flange extending away from the U-shaped channel generally orthogonally from the support surface for providing ventilation or drainage along an edge of the exterior wall surface.

25 72. A termination member according to claim 62 or claim 63 in the form of a top strip wherein the mounting portion includes a mounting plate, the spacing and

ventilation portion includes a perforated spacing surface extending outwardly from the mounting plate, and the positioning portion includes:

an inner positioning surface extending in one direction from the perforated spacing surface parallel to the mounting plate;

5 a support surface extending outwardly from the inner positioning surface; and

an outer positioning surface extending from the support surface parallel to the mounting plate;

whereby the inner positioning surface, support surface and outer positioning surface together form a substantially U-shaped channel adapted to receive and locate

10 a peripheral edge of the associated cladding panel.

73. A termination member according to claim 72 wherein the outer positioning surface is located on an outer positioning flange having perforations for keying with an over-coating render.

74. A termination member according to claim 72 or claim 73 including an

15 alignment flange extending generally outwardly from the outer positioning flange for supporting and aligning an applied exterior wall surface coating.

75. A termination member according to any one of claims 72 to 74 including a perforated flange extending upwardly away from the U-shaped channel generally orthogonally from the support surface to provide ventilation along an edge of the exterior wall surface.

20 76. A termination member according to any one of claims 62 to 75 formed from a material or material of sufficient strength to support the intended dead and imposed live loads, being selected from a group comprising metal, plastics, fibre cement, timber and composite materials.

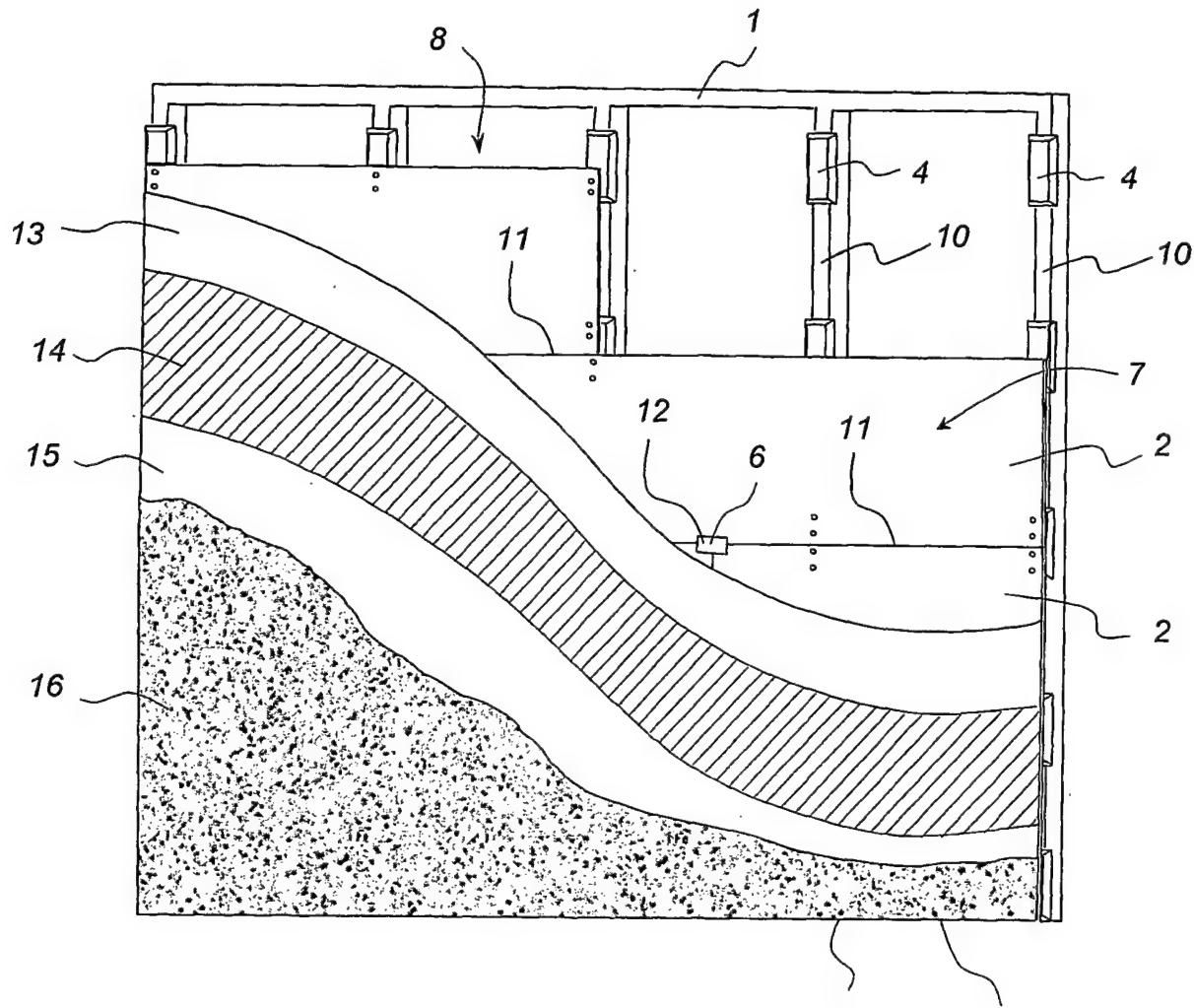


Fig. 1

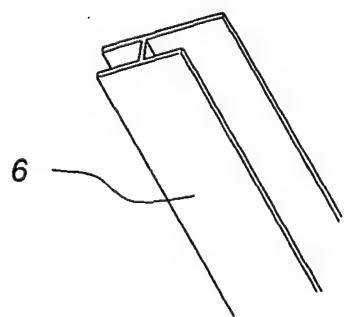


Fig. 2

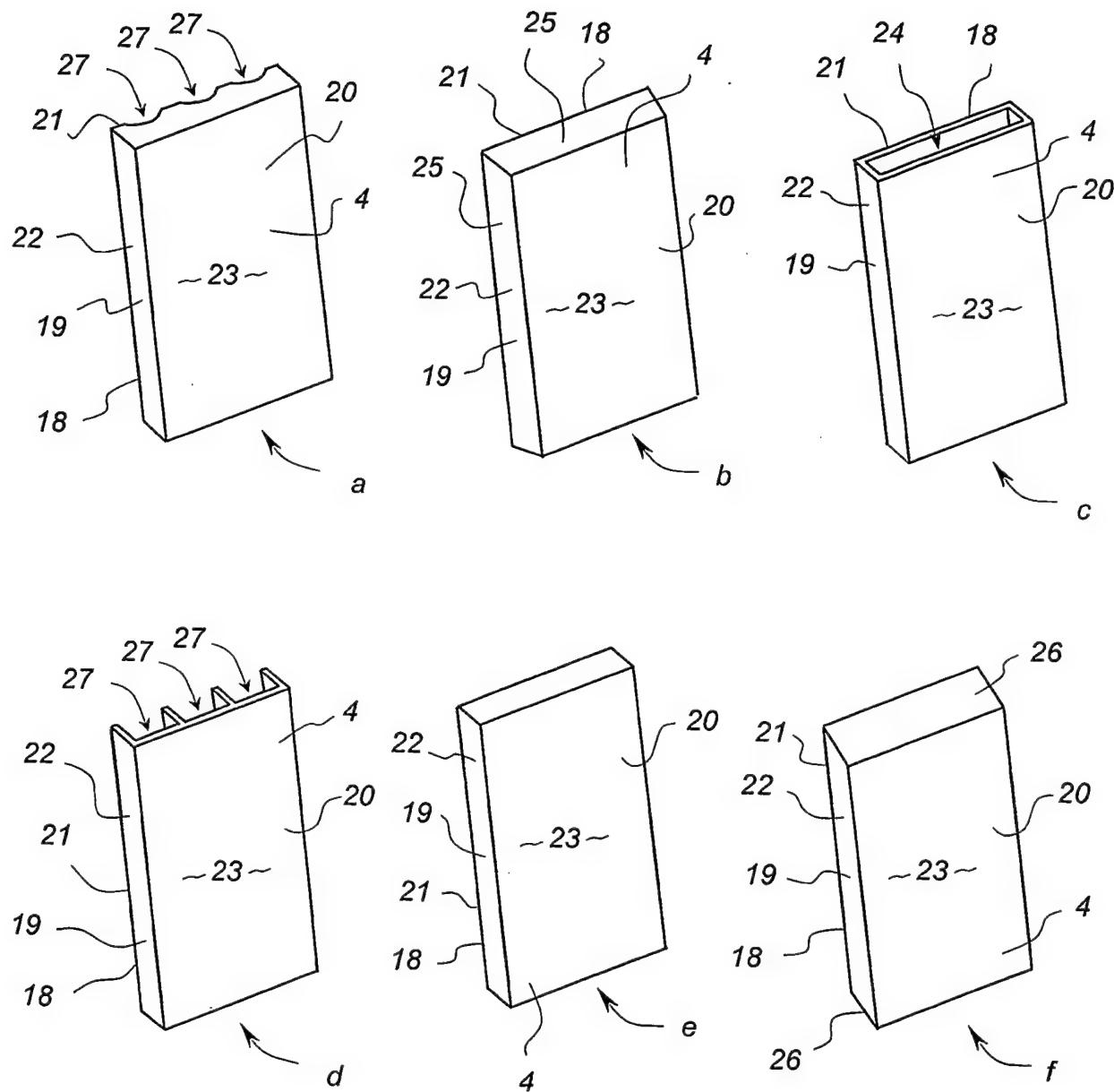


Fig. 3

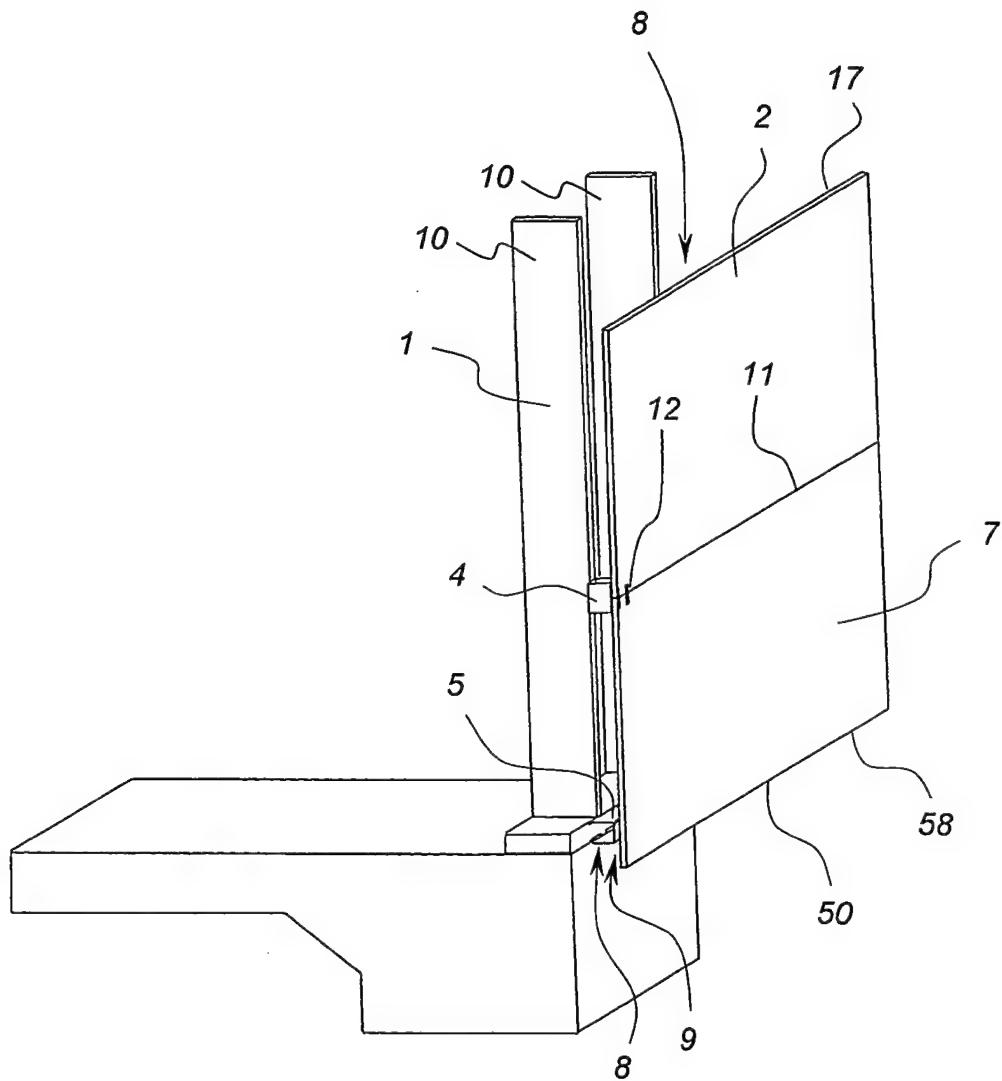


Fig. 4

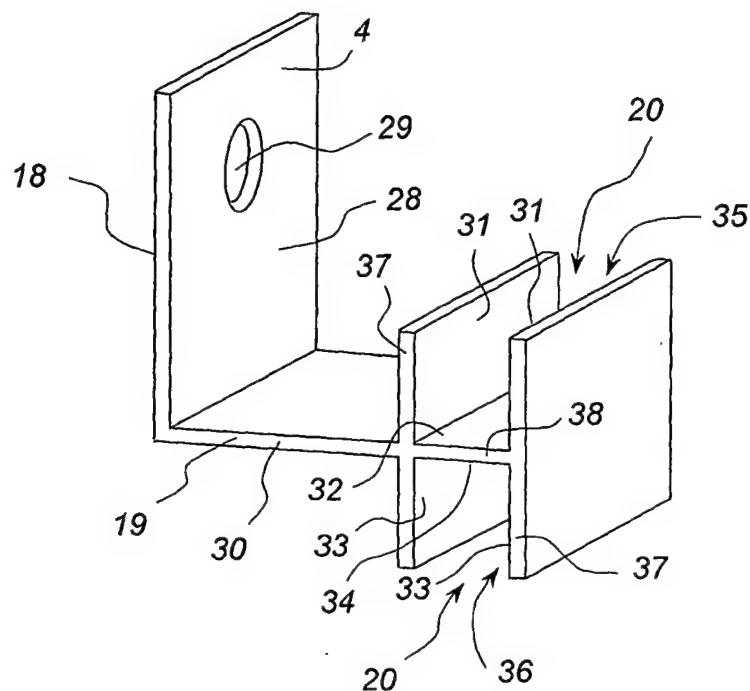


Fig. 5

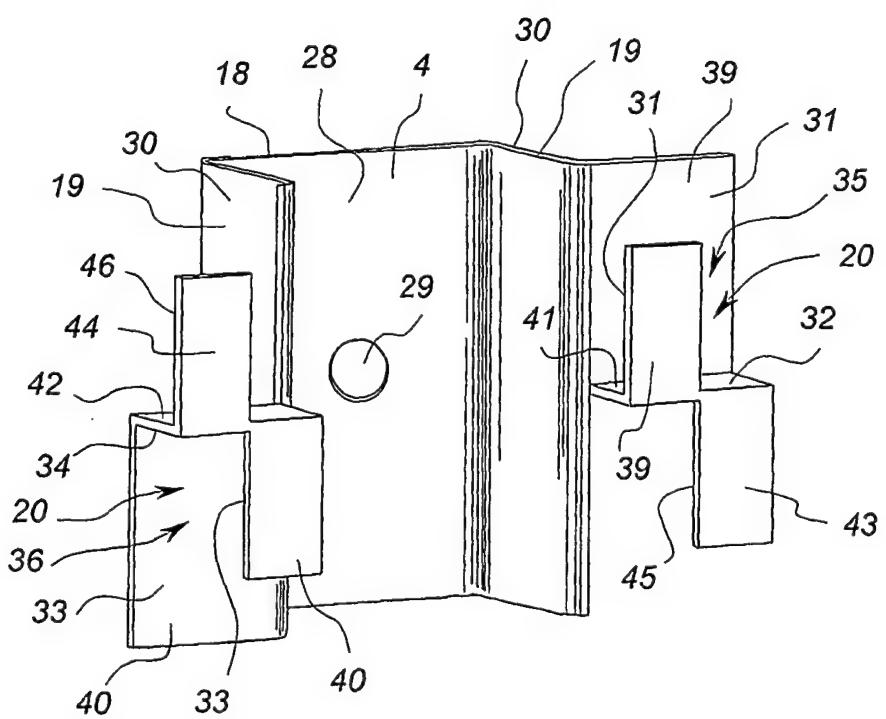


Fig. 6

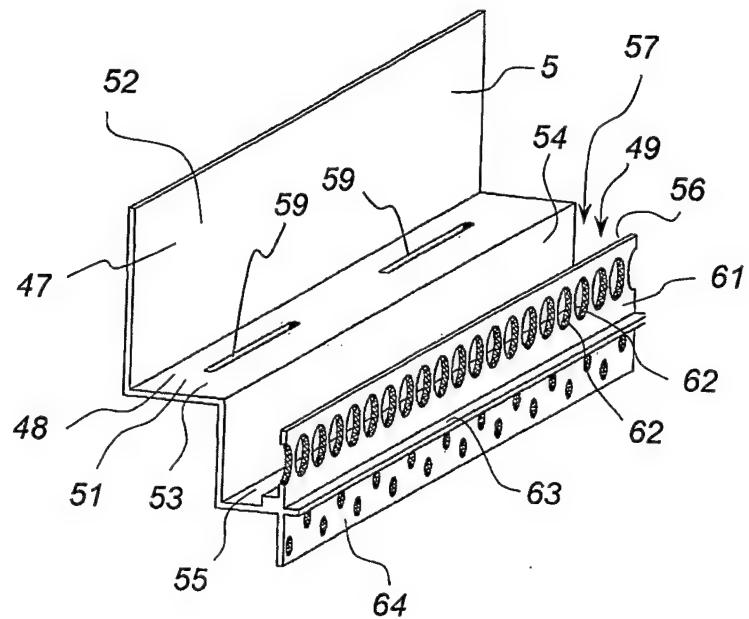


Fig. 7

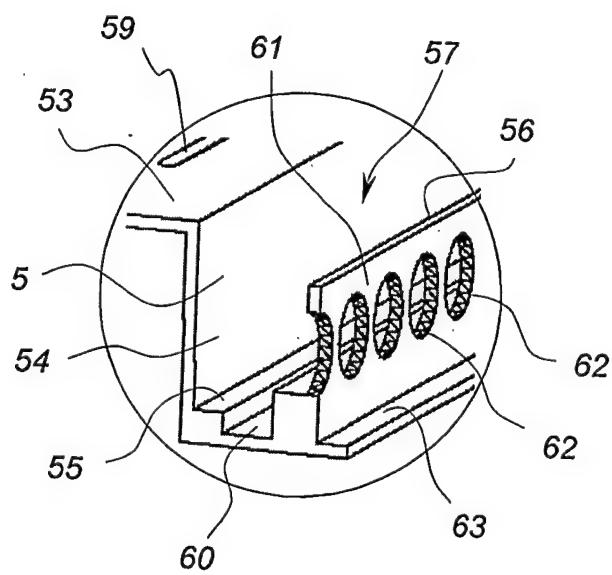


Fig. 8

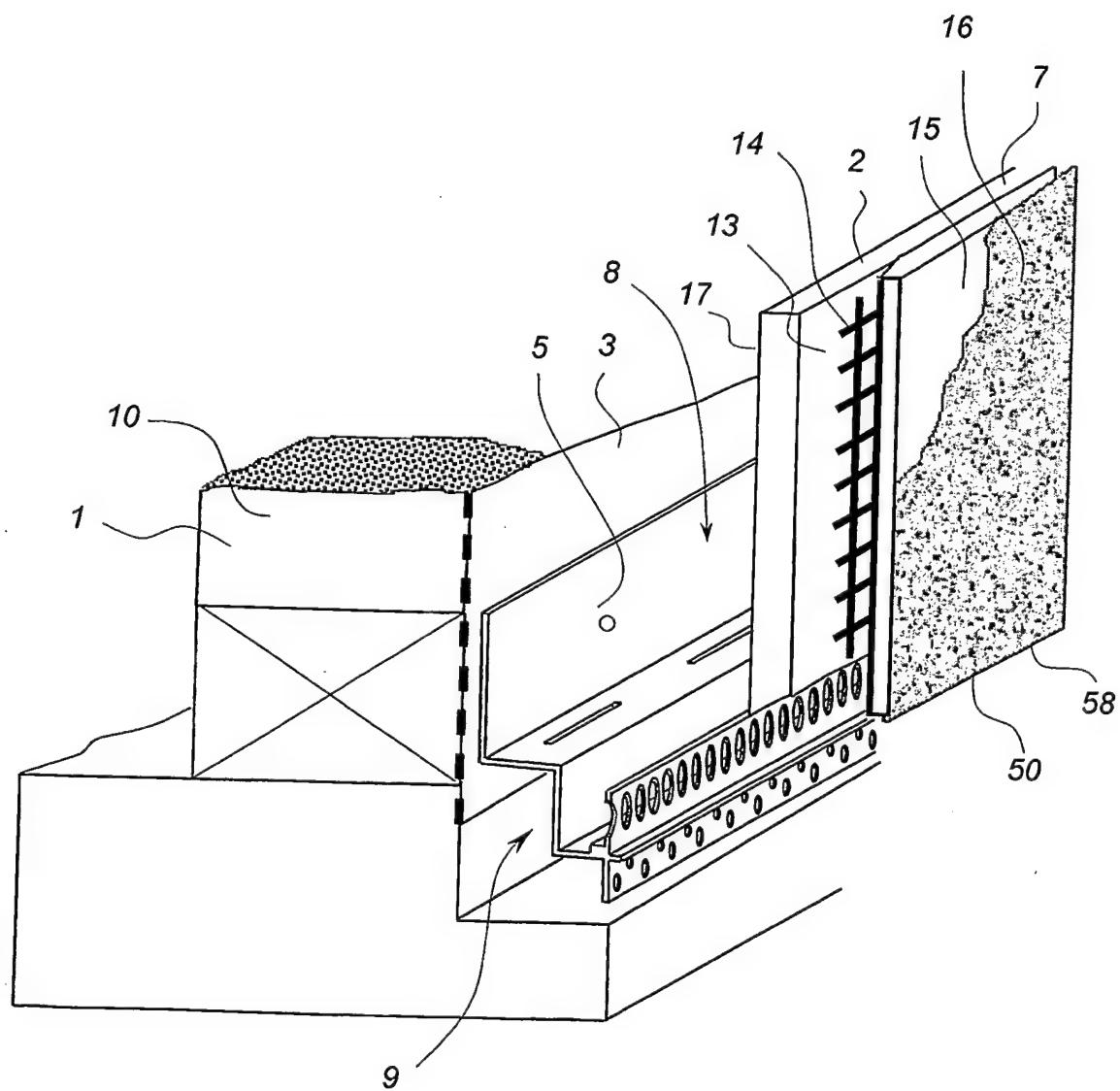


Fig. 9

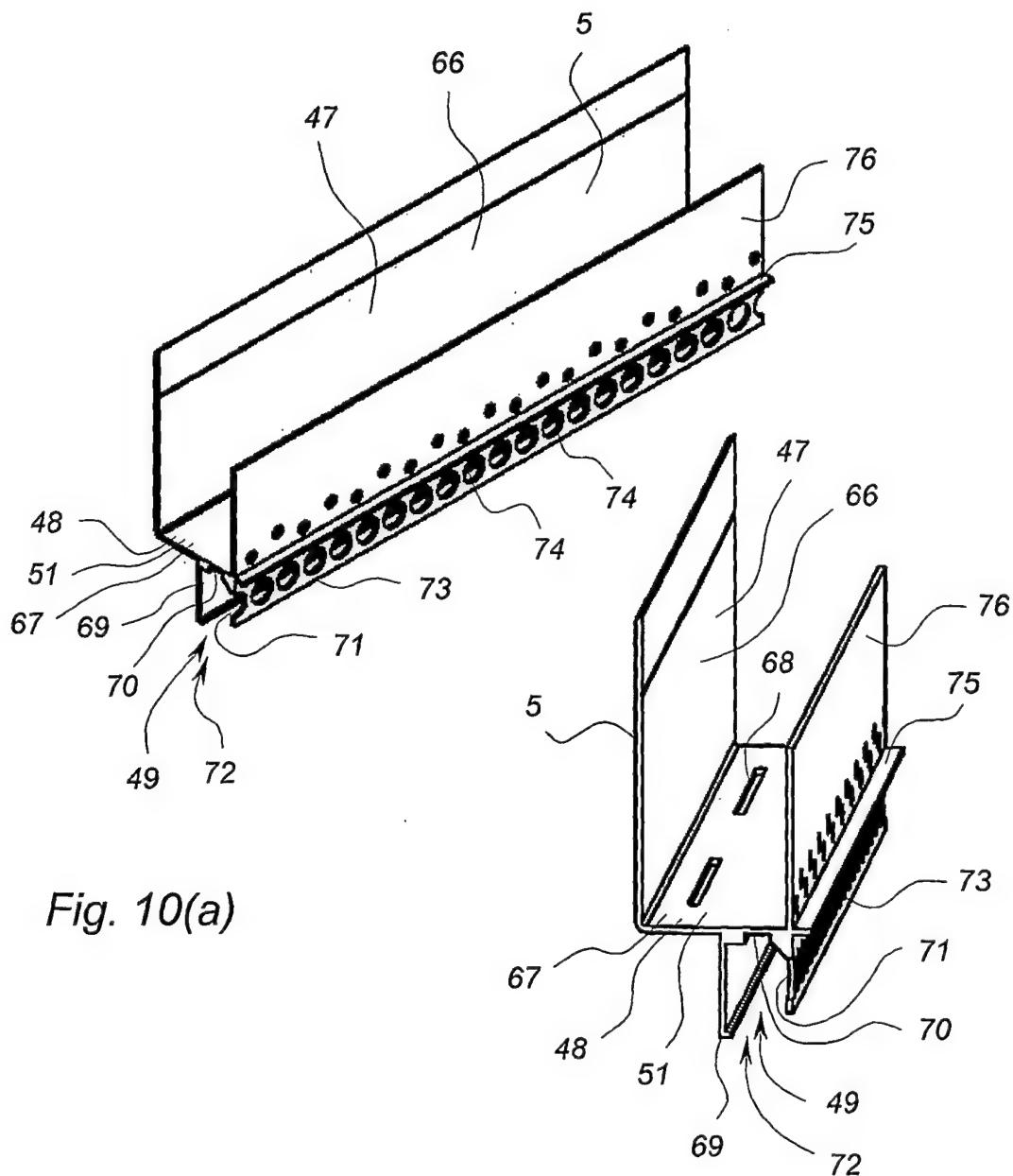


Fig. 10(b)

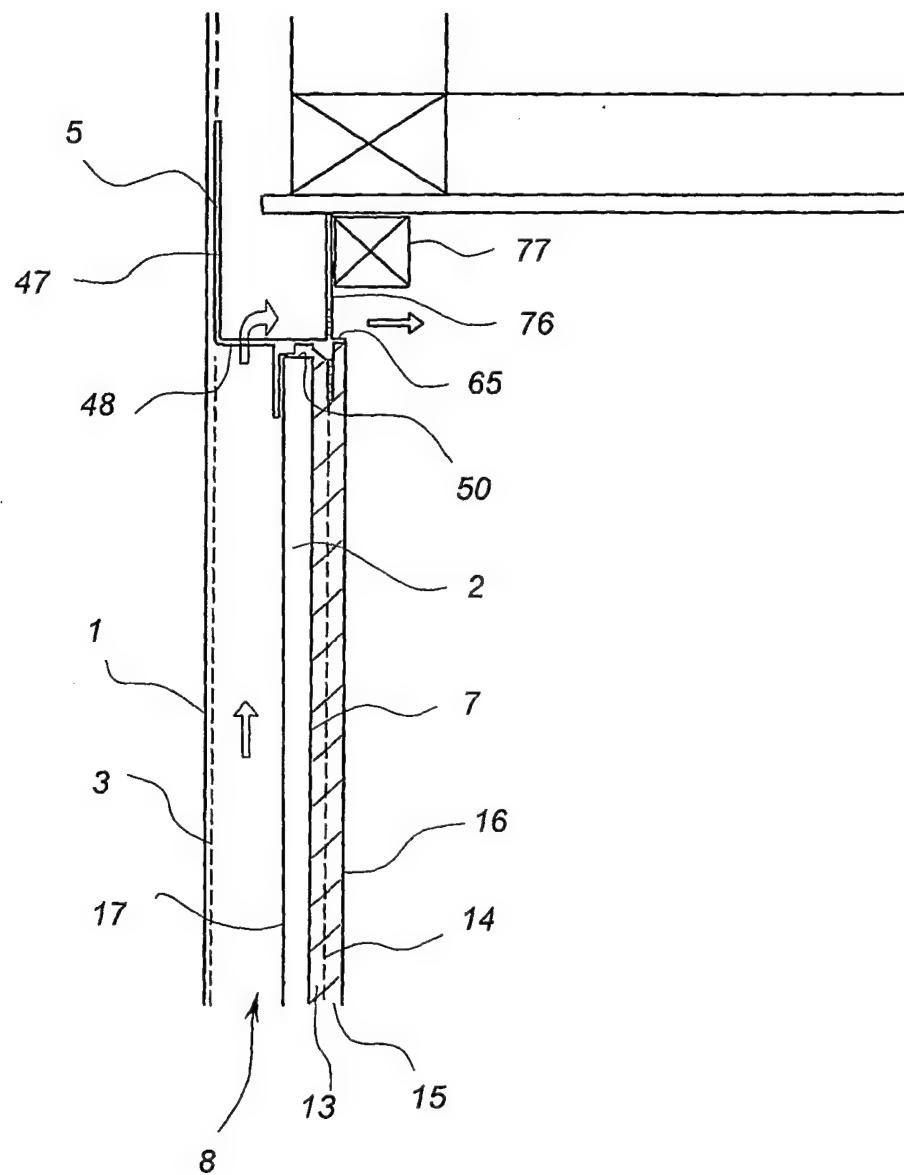


Fig. 11

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2005/001600

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

**E04B 2/30 (2006.01)**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 DWPI: IPC E04B 1/-, E04B 2/-, E04C 2/-, E04F 13/- and keywords; cladding, panel, facade, space, gap, cavity, drain, escape, migration, weep, moisture, liquid, condensation, edge, lip, termination & similar terms

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2002-47750 A (SANKYO ALUMINIUM KOGYO KK) 15 February 2002 See the figures	52-54, 60, 61
A	FR 2628775 A1 (GTM BATIMENT S.A. et. al.) 22 September 1989	
A	JP 11-247307 A (IG TECH RES INC.) 14 September 1999	62
A	US 5946870 A (BIFANO et. al.) 7 September 1999	62

Further documents are listed in the continuation of Box C

See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 19 January 2006	Date of mailing of the international search report 24 JAN 2006
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer  VINCE BAGUSAUSKAS Telephone No : (02) 6283 2110

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/AU2005/001600**

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2001/059228 A1 (VENTENSKAPSSTADEN) 16 August 2001	

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2005/001600

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

2.  Claims Nos.:

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3.  Claims Nos.:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See the additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/AU2005/001600

**Supplemental Box**

(To be used when the space in any of Boxes I to VIII is not sufficient)

**Continuation of Box No: III**

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1 to 51 are directed to a cavity wall system having cladding panels mounted a predetermined distance away from the wall structure. It is considered that system further including moisture control means defining a moisture control plane to minimise the migration of liquid moisture from the cavity into the wall structure comprises a first "special technical feature".
2. Claims 52 to 61 are directed to a mounting member and claims 62 to 76 are directed to a termination member 'or use' with the invention as defined in claim 4 or in the method of forming a cavity wall as defined in claim 29. The mounting member/termination member is not limited to be used with said claims and is not restricted to the special technical feature of claim 1. It is considered that the at least one positioning portion of the mounting member/termination member adapted for connection to the associated cladding member comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/AU2005/001600

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
JP	200247750				
FR	2628775				
JP	11247307				
US	5946870	CA	2259875	US	6119429
WO	0159228	AU	32569/01	EP	1254291
		SE	0000411	NO	20023754

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX